

Knowledge Construction and Dissemination in Graduate Education

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In this article we report research on the culminating seminar of an all-course Master of Education program. The seminar, a credit course, required students to construct and disseminate knowledge through an iterative process of critical dialogue and collegial critique. The research question was: Does this research seminar facilitate knowledge construction and dissemination? Our findings confirm that students constructed knowledge through interaction during web conferences. They created new understandings while drawing on previous and current personal and professional experiences and knowledge, and engaged in meaningful dissemination activities in their schools and communities.

Keywords: graduate education, constructivism, web-based conferencing, knowledge dissemination, peer mentoring.

Dans cet article, les auteures présentent leur recherche sur le séminaire qui vient couronner le programme de maîtrise en éducation. Le séminaire, qui est un cours à unité créditable, exige des étudiants qu'ils construisent et transmettent un savoir par le biais d'un processus itératif de dialogue critique et de critique collégiale. La question à laquelle les chercheuses tentaient de répondre était la suivante : ce séminaire de recherche facilite-t-il la construction et la transmission des savoirs ? Les données recueillies confirment que les étudiants ont construit leur savoir au moyen d'interactions dans le cadre de conférences Web. Ils ont construit de nouvelles compétences tout en mettant à profit leurs expériences et leur savoir personnels et professionnels et se sont impliqués dans des activités valables de transmission du savoir dans leurs écoles et leurs communautés.

Mots clés : études supérieures, constructivisme, conférences Web, transmission du savoir, mentorat par les pairs

When students successfully complete a master's thesis in a graduate program, they rightfully see themselves as producers of knowledge and acknowledged members of an academic community. When they

follow an all-course option, students may not find that same sense of accomplishment. The concern for Memorial University's faculty of education when introducing an optional all-course master's route was that students would complete a series of courses that, though valuable in themselves, could result in a program that did not provide opportunities for students to make connections between the knowledge explored in the discrete courses and that did not enable graduate students to see themselves as producers of knowledge. To address this issue, the faculty required students to complete a culminating course, the Research and Development Seminar.

When developing this course, the faculty articulated, in a series of planning meetings, two outcomes for students: knowledge construction and dissemination. They deemed these outcomes similar to those that result from the process of thesis writing. The purpose of this study was to determine if those outcomes were being met. The research question we explored was: Does our research and development seminar facilitate knowledge construction and dissemination by graduate students?

THE PROGRAM AND COURSE

Students in our graduate program choose from four routes: thesis, internship, portfolio, or comprehensive (all-course) routes, and from four different fields of study: teaching and learning, educational leadership, information technology, and post-secondary studies. Graduate students' careers and personal demands often influence their decision to pursue the all-course route. They do not have time to write a thesis, develop a portfolio, or undertake an internship because they are usually full-time educators. To accommodate all students, especially those living at a distance from Memorial University, we designed the seminar as a web-based course with at least two teleconferences.

The instructors for the seminar, the authors of this paper, required students to explore in greater depth a topic of interest and personal relevance that they had already considered in their graduate program. The products for evaluation included a research paper, a plan for dissemination of the research, and evidence of peer mentoring that occurred through web conferencing.

Students used web conferencing to provide feedback to each other as they developed their proposals for a research paper, to facilitate critical dialogue about the topics they decided to research, or to advise each other on dissemination plans. In this sense, critical dialogue

incorporated peer editing activities such as questioning the basis for assumptions and assertions, critiquing the research question, examining construction of the argument, or noting appropriate application of American Psychological Association publishing conventions. In explaining this activity to the students, we often referred to the process of peer review of articles submitted for publication in scholarly journals.

Through course requirements, students became evaluators of representations of knowledge as they read and responded to one another's proposals and drafts of the research papers and dissemination plans such as workshops, brochures, web pages, or seminars. The dynamic qualities of the web conference site facilitated student interaction and encouraged the development of a discourse community (Gee, 1990) within which social interaction around issues and topics of mutual interest occurred.

The course outline and its components, available on line, included informational pages such as goals of the course, process and delivery, evaluation, and peer-mentoring guidelines. The first meeting for all students occurred at a teleconference session during which we described the procedures, goals, and expectations for the course. Following the session, students arranged themselves in self-selected groups for peer mentoring, and we created folders or forums within the common conference space for each group's postings. Students used the technology, therefore, not only as a mode of delivery and the repository of data for their research, but also as the main means to engage in the objectives for the course: knowledge construction and synthesis (Tyner, 1998). We held a final teleconference session to receive feedback from students, provide general observations to students on their work, and bring closure to the course.

Each instructor had responsibility for several self-selected student groups and encouraged the process of knowledge construction and dissemination by identifying and encouraging development of ideas; reading students' research questions following the review by their peers and providing further guidance; requesting faculty members with expertise in students' research areas to be second readers of the research papers; or helping students disseminate knowledge to their chosen audiences (for example, by providing letters of support for students to their school districts).

The Ethics Review Committee of the Faculty of Education approved the research proposal to study the implementation of this new course; we apprised students of our intentions to evaluate the course and to

publish our findings. All students in the course, 20 in fall 1999 and 12 in winter 2002, consented to take part in this research.

THEORETICAL FRAMEWORK

As instructors for this course, we grounded our design and implementation in theories of constructivism and professional growth. Constructivist scholars, especially social constructivists, view learning and meaning making as a social act within a particular context and activity. Individuals create understanding of phenomena in relation to what they already know and believe (Richardson, 1997; Wertsch, 1991). Knowledge construction occurs when learners engage in meaningful activities, activities that are authentic in a real situation (Petraglia, 1998). Several researchers have advanced the value of constructivist theory for undergraduate and graduate teacher education and teacher professional development (Keiny, 1994; Louden & Wallace, 1990; Winitzky, Stoddart & O'Keefe, 1992; Zeichner, 1992). Ross and Regan (1993) claim that sharing professional experience is such an important element of professional growth that it has become axiomatic for inservice events to provide opportunities for participants to describe their experiences, reflect on the meanings of personal practice, and exchange interpretations with colleagues. Ross and Regan define professional development as changes in understanding, affect, and action that increase effectiveness in a role. Schön (1987) observed that growth of the reflective practitioner occurs through dialogue in which teacher and learner reframe experience and conduct experiments to improve practice.

METHOD

As active participants in the research (Adler & Adler, 1994), we drew on several data sources: students' comments in their ongoing electronic Site Scape Forum postings to each other, which we identify in this paper as "SSF posting"; students' comments in a final course evaluation teleconference session (fall 1999) and written responses (winter 2002); comments from second readers (professors) of students' research papers; and students' comments about dissemination, including their descriptions of the modes that they used to share their knowledge with a wider audience. With the students' knowledge and consent, we archived these data.

During spring and summer 2002, we considered the data and engaged in analysis, using Merriam (1998) and Stake (1995) to guide the process. We began with a general review of all data, formulating reflective notes. We identified patterns, linking preliminary conceptual categories that arose among the sets of data. Using methods of analytic induction (Miles & Huberman, 1994), we categorized the data with reference to our constructivist and professional development theories. We further reviewed the data, discussing our categories and revising them as necessary to develop themes on constructivism and knowledge dissemination that the evidence supported. Rejecting redundant themes and collapsing themes that blended, we arrived at three main themes:

1. social interaction as integral to knowledge construction and meaning making (Davydov, 1995; Dewey, 1916; Moll, 1990; Vygotsky, 1978; Wertsch, 1991).
2. creation of new understandings from previous and current personal and professional experiences and knowledge (Forman & Cazden, 1985; Peterson, 1992; Richardson, 1997; Steffe & Gale, 1995; von Glaserfeld, 1990).
3. engagement in meaningful activities within authentic contexts for relevant purposes, i.e., application to students' professional work (Condon, Clyde, Kyle & Horde, 1993; Petraglia, 1998; Ross & Regan, 1993; Schön, 1987).

FINDINGS

In this section, we discuss each theme in relation to the research literature on constructivism in knowledge production and dissemination. To provide a more rich understanding, we have illustrated these themes with compelling quotations from our data.

Theme 1: Social Interaction

The implementation of this course required a collaborative approach in which students formed groups of three or four in a web-based conference. Students selected their own groups, based on shared interests or a desire to learn about the others' interests. We had access only to the social interactions during the web conferences, which totaled 461 messages in the fall 1999 course and 517 in the winter 2002 course. Other social interactions included various technology-mediated communication (telephone, e-mail) and face-to-face meetings when

students lived close to each other. Students made plans together, agreed on synchronous on-line meeting times, defined the group's modus operandi, and engaged in focused conversations about a wide range of interests including their work in the course and their professional lives.

In final written feedback to us and in the teleconferences, we asked students to reflect on the web conference as a tool for interaction and discussion. In analyzing these responses, we discerned two ways in which the social interaction occurred: through the medium of the technology itself, and through comments about construction of knowledge in social ways.

Technology as social interaction. Students viewed the web technology as central to the discourse. Throughout the semester, the web conference environment facilitated intensive and extensive peer feedback. Students engaged in ongoing interaction throughout the semester, with multiple readings and edits of the same research paper. To achieve such focus, students inserted questions in the text and highlighted or underlined problem areas; respondents reacted similarly.

Some students commented explicitly on the use of the technology for peer conferencing.

In the long run, I feel that using a web-based format for a course like this one can be very beneficial to the students located in various localities. Distance education is difficult for many, but access through these technologies can be useful and helpful for all involved. (Student written feedback, winter 2002)

Such comments indicate that students experienced what the research literature has demonstrated: the usefulness of information communication technologies (ICTs) to prompt interaction among students (Althaus & Darnall, 2001; Bonk, Daytner & Daytner, 2001; King, 2001).

Other comments from students noted the importance of collaboration that technology facilitated for them.

The [SiteScape Forum (SSF)] was a valuable tool for passing on information and data concerning the papers and presentations which were part of this course. When concerned over questions of content, arrangement or wording, any of the group members were able to post their concerns and seek assistance. For me, this was a worthwhile tool in the completion of the assignment and researching of information for my paper, for a variety of reasons. (Student written feedback, winter 2002)

I find I'm much more involved in discussion using the web than any course I took. I have time to think about what I'm going to say and I'm more comfortable expressing my views. (Student written feedback, winter 2002)

Research on the use of ICT supports the notion that teachers find it useful to reflect on their learning process and the ways in which ICT has supported it (Joa, 2001; Murphy & Cifuentes, 2001; Oakes, 1998). They are likely to apply such insights in their own classroom work when they implement inquiry-based learning activities, whether web-facilitated or not (Blanton, Simmons, & Warner, 2001; Wilson & Lowry, 2000). Sarason (1990) stated that productive learning for students can occur only when they have conditions for productive learning.

Students valued the technology for the immediacy of the communication, the safe environment for peer editing and critique, and the delay time for reflection and response.

Facilitating knowledge construction. Comments in this theme focused on the ways in which social interaction facilitated knowledge construction.

During this term, the peer feedback which my group partners were able to give me concerning various aspects of my topic, the proposal and final paper was vital to the final work. It is important to all students (at any age) to find peers who are willing and capable of advising on your work and offering advice and suggestion for improvement. (Student written feedback, winter 2002)

Students gave close attention to one another's papers, often either cutting and pasting a section of the draft or inserting comments into the text and reposting it for their colleagues. Each group contained three or four students; hence at least two peer editors provided feedback for each writer.

Students acknowledged the role of interaction and feedback in meaning making.

First, the SSF allowed my group partners to communicate to me any additional information which they might have encountered during their own research. Since the topics which were chosen by my partners had the potential of linking up my own, there were several opportunities for us to share information about potential sources of information. (Student written feedback, winter 2002)

Another student commented that the exercise of critiquing a colleague's work had personal value: "I'm finding that as I critique other proposals, I am reflecting on my own as well, so perhaps it has a dual purpose. What do you think?" (SSF posting, February 1, 2002). These comments demonstrate that both the technology and the peer mentoring encouraged the social interaction that led to knowledge construction.

Theme 2 Creating New Understandings

The discourse in web forums revealed that students drew on their personal and professional knowledge to offer each other support and advice, to provide critical commentary, to ask probing questions, and to make suggestions. In analyzing the data, we found evidence of students' creating new understandings in two ways: students drew from previous understandings and experiences to make connections; they made connections with personal professional knowledge and current research knowledge to arrive at new understandings.

Previous understandings. In their interactions, students constructed new knowledge by making connections between former work and/or experiences and each other's ideas. The following students' comments illustrate the process of knowledge construction.

Your rationale [in the research proposal] for problems in student achievement holds true with my personal teaching experiences. It seems that the gap between the strengths and needs of our students widens each year. (SSF posting, October 2, 1999)

I am now beginning to realize that your experience with problems in teaching math in Grade 5 are similar to what I hear high school math teachers say. There must be some way for us to address this link. (SSF posting, December 3, 1999)

Such comments demonstrate that students benefited from collaboration, in which they gained insights and built new knowledge on previously held knowledge. Peer mentors confirmed ideas posted by colleagues in the web forum, and students demonstrated knowledge building as they made connections to each others' experiences and comments.

In some cases, the interaction revealed similarity between and afforded support for both initiators' and responders' research.

I have worked with many learning-disabled children who exhibit characteristics of learned helplessness and therefore find your topic to be of great interest. I am planning to have a section of my web page look at this concept. (SSF posting, September 21, 1999)

I am interested in your topic of learned helplessness, especially as it relates to preschoolers. As a former Grade Kindergarten teacher, and now as a Grade One teacher, I have encountered children who have little or no interest in assigned classroom tasks. How often have I heard, 'I can't do that, Miss!?' Even with my help, there seems to be a feeling of helplessness in these children. (SSF posting, November 11, 1999)

As they read and critiqued each other's papers, students verbalized ways to broaden their own understandings of their teaching situation. Knowledge ceased to be information apart from the knower; it became "the conceptual means to make sense of experience, rather than a 'representation' of something that is supposed to lie beyond it" (von Glaserfeld, 1990, p. 27).

New understandings. In their discussions, students often articulated connections between previously acquired ideas and knowledge and current research that they had encountered in courses throughout the graduate program. They often revealed that their ideas connected to the thoughts of the educational theorists they had studied.

In the following quotation, this student draws together ideas from her colleague's paper, her course readings, and her own teaching situation. She incorporated research previously studied in meaningful ways when she analyzed and synthesized information, critiqued others' papers, and built understanding of her topic.

R., as I was giving your proposal a reread, the thought occurred that the mentoring process has many more applications than the experienced teacher-inductee model. While not formalized in the sense of the inductee-mentor designation, the practice of collaborative teaching certainly promotes the capacity for mentorship. Wallace, Engel and Mooney (1997) touch on this in their final chapter.¹ Hargreaves and Evans (1997) promote teacher learning communities which parallel the practice of the mentoring in some ways. Senge's (1990) concept of the learning organization lends strongly to the development of the mentors throughout the system.

With the introduction of the new curricula across high school, the emergence of the mentors within the teaching cadre will, I believe, become a significant way of ameliorating the inherent frustrations of the implementation of the new programmes. The watchword for the future will be P.D. [Professional Development]. Mentoring is just one of the many forms it will take. Later, E. (SSF posting, February 16 2002)

Peer interaction on the web forum encouraged and facilitated reflective comment.

With the postings in front of him to review, the student's comment in the following quotation suggests that he discerned patterns in both the theory he read and the discussions he and his colleagues shared as they related their writing to their daily school experiences. He called on his colleagues to confirm his impressions and collaborate in his synthesis of knowledge.

One thought which keeps recurring throughout this process is the inability we have as educators to bring the theory to reality. So often in the progress of my reading I am

encountering accounts of resistance and inadequacy, as site-based management becomes merely another step in the hierarchy, rather than the empowerment of stakeholders that it is intended to be. The other thread that runs through the fabric of the education theory is the complexity of values orientation in education. Thomas Greenfield [sic], who is perhaps my greatest hero in educational theory, along with Thomas Sergiovanni, wrote often of the values component in school reform. I am beginning to see, within the context of the recent research, that concept being given more press. The application of the values component to the leadership domain appears to be a positive influence, the value-added component is not implicitly emphasized. Sergiovanni's servant leadership carries the values model with it and many recent writers are referencing his ideals in their writing. Recent writers like Leithwood, Hannay-Ross and Datnow are including the values component in their findings. I am wondering who are the influential theorists others have seen emerging throughout their reading. (SSF posting, March 11, 2002)

In his reflection, the student who posted the next comment articulated connections between theory he discerned from his readings and his own experience in a school system. The web forum gave him space to acknowledge other ideas emerging in his research that did not relate to his formal paper, ideas that are important in his self-construction as an educational leader.

I have come across a fair number of articles which relate to the topic in one way or another. It is interesting to me that the same idea can be presented in so many dimensions and in so many places and the same problems and the same practices evolve. A manda Datnow, Lynn Hannay-Ross, Karen Seashore-Louis, Leithwood, Jantzi, Steinbach, Darling-Hammond and others all have written extensively on the teacher leadership as a part of the reform process. Many of these writers do not negate the early theorists like Stogdill; they merely extend the concept. The role of the principal in developing a school model of the leadership is an important one, and one which is receiving some negative press from writers like Leithwood, et al. And Marks and Seashore Louis and others as principals fail to follow through on the well-grounded theory at the expense of teachers. While I do not wish to focus on it in my paper, the incidence of the teacher burnout as a result of poorly conceived and implemented reform plans is on the rise (Leithwood, Jantzi, Steinbach, 1999). Sad but true. Sadder still are the numbers of practising principals who have no training in organizational theory and shared leadership. (SSF posting, March 10, 2002)

These data reveal that these students constructed knowledge by making connections to previous knowledge and by receiving suggestions from course colleagues. They shared a common interest and experience, both in schools and previous course work, that provided the basis for their interaction and increased the range of resources for each group member. They also incorporated educational theory in the web forum discussions.

Theme 3 Application to Students' Professional Work

In addition to constructing knowledge, students should see their graduate learning as meaningful in their professional lives (Ross & Regan, 1993). Their knowledge of learning, schooling, educational leadership, and so on should be shared within their own situations, which for most of these students was in schools as teachers and principals. To give these graduate students an opportunity to see themselves as constructing new knowledge in a meaningful way, we required each one to devise a plan for disseminating the knowledge that they had acquired during the course to a select audience. When students understood the connection between constructing knowledge and disseminating it, they realized the goal of considering themselves as producers of knowledge.

Students viewed dissemination as a purposeful activity that they were undertaking especially for selected audiences. The dissemination plans included a variety of activities: web sites, pamphlets, policy position papers, videos and workshops, all of which required the students to disseminate the research knowledge of their papers in a meaningful way to a selected audience. One student observed: "Doing the workshop for parents was really helpful. I had to turn research language into a language for them and to think about their perspective" (SSF posting, February 5, 2002). Another stated: "The more I thought about it—the leaflet—it was coming into the hands of people who can use it. This was a learning process for me—thinking about putting information directly in people's hands" (SSF posting, February 7, 2002). The dissemination activity encouraged students to revisit their knowledge in a different context, to select, analyze, synthesize, and translate it into a different discourse, gaining in the process a greater sense of their own expertise. One reflected on the value of dissemination: "I gained confidence. I liked sharing with others, and I'm also glad my work is not on a shelf. It's there for others to look at" (SSF posting, February 1, 2002). Such statements demonstrate the developing perception of accomplishment embedded in knowledge dissemination.

In the next quotation, this student shows her sense of accomplishment in her personal knowledge and her growing ability to articulate it publicly.

I'm on the Teaching and Learning program, but I was dealing with [educational] change and the two people in my group helped me to focus. I also learned to develop my political skills better. For my dissemination I was telling my bosses how to do things better. (final teleconference, fall 1999)

Comments from second readers (professors) provided further evidence

that students had become knowledge producers and that they could disseminate their work to an appropriate audience. A professor who allowed a student to disseminate her work by presenting it in his undergraduate education class describes how the dissemination had relevance for him.

I allowed [the student] to present an overview of her research in one of my classes. Her presentation convinced me of the relevance of this seminar format and the creation and presentation of "new knowledge." ... I finished [reading] her research product... with a sense that I had learned certain things that I had not previously considered.... Thus, new knowledge, for me at least, was created and presented. (Professor A's evaluation comment, fall 1999)

The work took on meaning as students claimed the knowledge as their own and demonstrated their willingness to disseminate it. In this way, they saw themselves engaged in knowledge construction and its application to their work. The professional development activity of dissemination enhanced the personal and professional value of their work.

CONCLUSION

The question posed for this research was: Does the seminar course accomplish the goals that the faculty envisioned for students: knowledge construction and dissemination? We have concluded that our curriculum, which incorporated a social constructivist approach and promoted critique, in turn enabled graduate students to construct and disseminate knowledge. It did help them become directly involved in knowledge construction and dissemination.

The nature of the course delivery, particularly the social interaction that occurred through the use of electronic bulletin boards, facilitated peer mentoring and provided the context for knowledge construction and sharing. Students demonstrated that they were building knowledge from experience and making connections to other prior knowledge and to new ideas as they synthesized and constructed knowledge. Students saw the work of creating and sharing knowledge as relevant in their professional work. We have concluded that we realized the goal of our graduate course as professional development through students' dissemination plans.

Technology, which facilitated access to the course and completion of the program by all students in the course, created the opportunity for social interaction and knowledge construction. The students confirmed that the technology used in the course was significant in enabling them to achieve the goals of the course.

ABOVE AND BEYOND

The introduction of this course has had an impact on our faculty of education and the provincial school system in a variety of ways. Within our faculty, the course and our research has enhanced the culture of collaboration in which students have a valued role. In the school system, where many of the students presented their knowledge, teachers, principals, and school board personnel received knowledge that was constructed and shared with their needs in mind. In this way, our graduate course extended into professional development activities in various school districts. Communities also benefited when students in the course shared knowledge with parents about school programs and offered advice to enhance children's learning. Teachers, as graduate students, have experienced the principles that underlie this course — knowledge construction, peer mentoring, scholarly review, and knowledge dissemination — and now carry with them the potential to spread an appreciation of these principles.

NOTES

- 1 Our reference list does not include citations for authors mentioned only in students' quotations.

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